TE / IT / V (Rev.) 22/11/2
CGVRS

22 12 Con. 7588-12.

KR-5147

(3 Hours) [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of remaining **six** questions.
(3) Assume suitable **data** if **necessary** and state the assumptions **clearly**.

1. Solve any **four** :—
   (a) Draw and explain basic block diagram of Virtual Reality System. **5**
   (b) Explain the significance of Homogeneous Co-ordinate System. **5**
   (c) Rotate a triangle ABC by an angle 30° where the triangle has co-ordinates A(0, 0), B(10, 2) and C(7, 4) **5**
   (d) Compare DDA line algorithm with Bresenham's line algorithm. **5**
   (e) List at least three input and three output devices of VR system and explain any one device in detail. **5**

2. (a) Prove that a shear transform can be expressed in terms of rotation and scaling operations. **7**
   (b) Specify highlights and drawbacks of Bezier curves. Construct the Bezier curve of order three with control points P1 (0, 0), P2(1, 3), P3(4, 2) and P4(2, 1). Generate at least five points on the curve. **13**

3. (a) Describe any two VR architectures with neat diagrams. **10**
   (b) What are Fractals ? Derive an equation D = log N/log S. Outline the procedure of generating Koch curve or Hilbert curve. **10**

4. (a) Develop a single transformation matrix which does the following on given object :— **6**
      (i) Reduces the size by 1/2
      (ii) Rotates about Y axis by (–30°)
      (iii) Performs a single point perspective transformation projection to z = 0 and z = 10.
   (b) Derive a 3D inverse transformation for translation and scaling. **4**
   (c) Explain with example Sutherland-Hodgeman Polygon clipping algorithm. List the short comings of this method, if any. **10**

5. (a) What are the different types of projection ? Derive the matrix representation for perspective transformation in XY plane and on negative Z-axis. **10**
   (b) Explain flood fill algorithm using four and eight connected method with suitable example and diagrams. Compare the same with boundary fill algorithm. **10**

6. (a) Compare the capabilities and limitations of geometric and kinematic modeling techniques. **10**

   (b) Compare —

   (i) Mesh and Feature based warping **5**

   (ii) 2D and 3D Morphing. **5**

7. (a) Using Liang Barsky Algorithm, find the clipping co-ordinates of line segment with end co-ordinates A(–10, 50) and B(30, 80) against the window ($X_{min} = -30$, $Y_{min} = 10$) ($X_{max} = 20$, $Y_{max} = 60$). **10**

   (b) Write a detailed note on VR applications. **10**